



DATA SHEET

MMBT3904

NPN GENERAL PURPOSE SWITCHING TRANSISTOR

VOLTAGE	40 Volts	POWER	225 mWatts	SOT-23	Unit: inch (mm)
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FEATURES

- NPN epitaxial silicon, planar design
- Collector-emitter voltage $V_{CE} = 40V$
- Collector current $I_C = 200mA$
- Pb free product are available : 99% Sn above can meet Rohs environment substance directive request

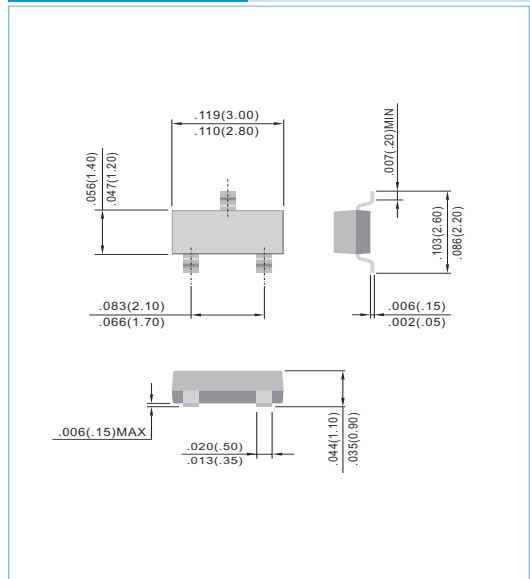
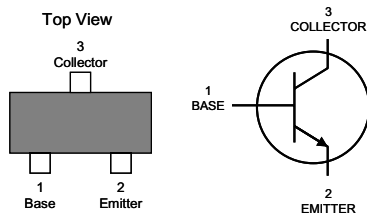
MECHANICAL DATA

Case: SOT-23, Plastic

Terminals: Solderable per MIL-STD-202G, Method 208

Approx. Weight: 0.008 gram

Marking: S1A



ABSOLUTE RATINGS

PARAMETER	Symbol	Value	Units
Collector-Emitter Voltage	V_{CE0}	40	V
Collector-Base Voltage	V_{CB0}	60	V
Emitter-Base Voltage	V_{EB0}	6.0	V
Collector Current - Continuous	I_C	200	mA

THERMAL CHARACTERISTICS

PARAMETER	Symbol	Value	Units
Max Power Dissipation (Note 1)	P_{TOT}	225	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^{\circ}C/W$
Junction Temperature	T_J	-55 to 150	$^{\circ}C$
Storage Temperature	T_{STG}	-55 to 150	$^{\circ}C$

Note 1: Transistor mounted on FR-5 board 1.0 x 0.75 x 0.062 in.

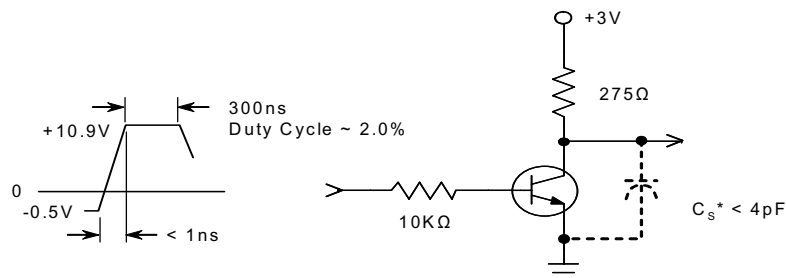


ELECTRICAL CHARACTERISTICS $T_A=25^{\circ}\text{C}$

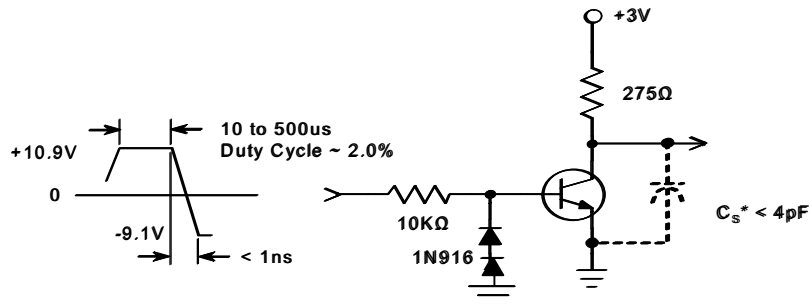
PARAMETER	Symbol	Test Condition	MIN.	TYP.	MAX.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=1.0\text{mA}, I_B=0$	40	-	-	V
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=10\mu\text{A}, I_E=0$	60	-	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=10\mu\text{A}, I_C=0$	6.0	-	-	V
Base Cutoff Current	I_{BL}	$V_{CE}=30\text{V}, V_{EB}=3.0\text{V}$	-	-	50	nA
Collector Cutoff Current	I_{cEX}	$V_{CE}=30\text{V}, V_{EB}=3.0\text{V}$	-	-	50	nA
DC Current Gain (Note 2)	h_{FE}	$I_C=0.1\text{mA}, V_{CE}=1.0\text{V}$	40	-	-	-
		$I_C=1.0\text{mA}, V_{CE}=1.0\text{V}$	70	-	-	-
		$I_C=10\text{mA}, V_{CE}=1.0\text{V}$	100	-	300	-
		$I_C=50\text{mA}, V_{CE}=1.0\text{V}$	60	-	-	-
		$I_C=100\text{mA}, V_{CE}=1.0\text{V}$	30	-	-	-
Collector - Emitter Saturation Voltage (Note 2)	$V_{CE(SAT)}$	$I_C=10\text{mA}, I_B=1.0\text{mA}$ $I_C=50\text{mA}, I_B=5.0\text{mA}$	-	-	0.2 0.3	V
Base - Emitter Saturation Voltage (Note 2)	$V_{BE(SAT)}$	$I_C=10\text{mA}, I_B=1.0\text{mA}$ $I_C=50\text{mA}, I_B=5.0\text{mA}$	0.65 -	-	0.85 0.95	V
Collector - Base Capacitance	C_{CBO}	$V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$	-	-	4.0	pF
Emitter - Base Capacitance	C_{EBO}	$V_{CB}=0.5\text{V}, I_C=0, f=1\text{MHz}$	-	-	8.0	pF
Delay Time	t_d	$V_{CC}=3\text{V}, V_{BE}=-0.5\text{V}, I_C=10\text{mA}, I_B=1.0\text{mA}$	-	-	35	ns
Rise Time	t_r	$V_{CC}=3\text{V}, V_{BE}=-0.5\text{V}, I_C=10\text{mA}, I_B=1.0\text{mA}$	-	-	35	ns
Storage Time	t_s	$V_{CC}=3\text{V}, I_C=10\text{mA}$ $I_{B1}=I_{B2}=1.0\text{mA}$	-	-	200	ns
Fall Time	t_f	$V_{CC}=3\text{V}, I_C=10\text{mA}$ $I_{B1}=I_{B2}=1.0\text{mA}$	-	-	50	ns

Note 2: Pulse Test: Pulse Width < 300 us, Duty Cycle < 2.0%.

SWITCHING TIME EQUIVALENT TEST CIRCUITS



Delay and Rise Time Equivalent Test Circuit



Storage and Fall Time Equivalent Test Circuit



ELECTRICAL CHARACTERISTICS CURVE

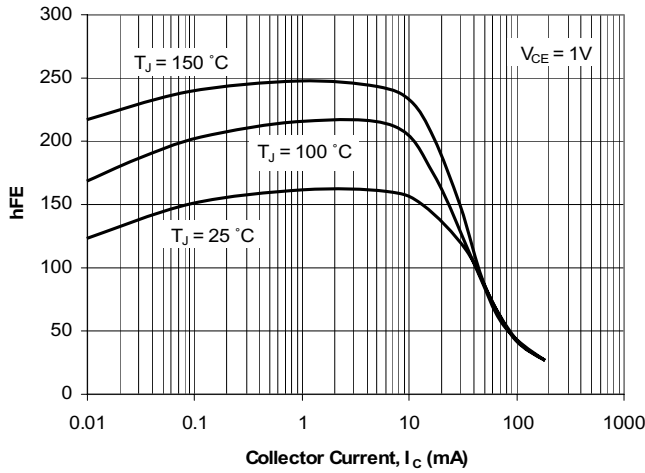


Fig. 1. Typical h_{FE} vs Collector Current

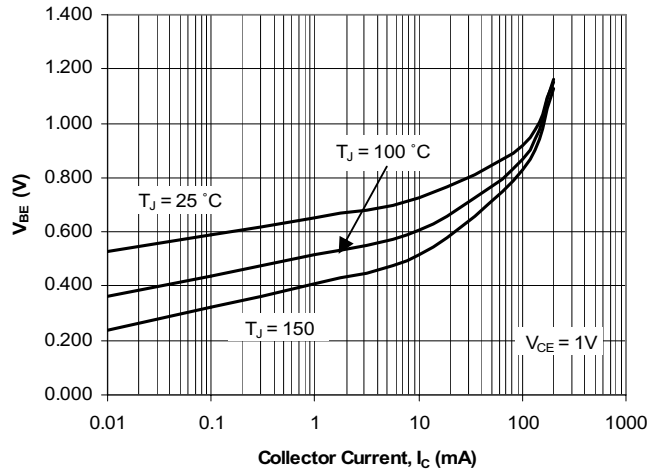


Fig. 2. Typical V_{BE} vs Collector Current

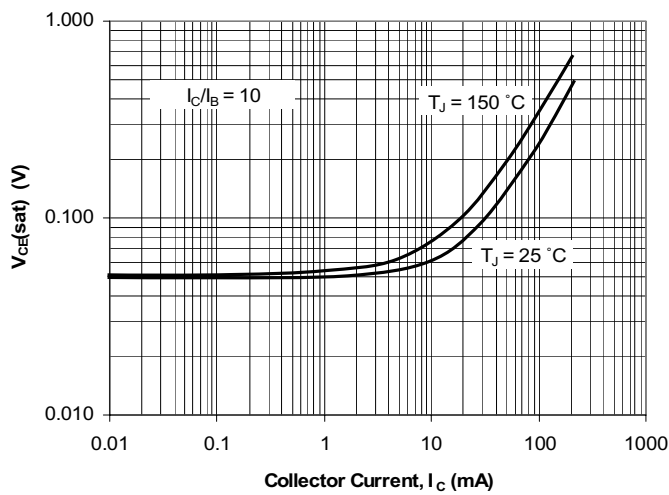


Fig. 3. Typical V_{CE} (sat) vs Collector Current

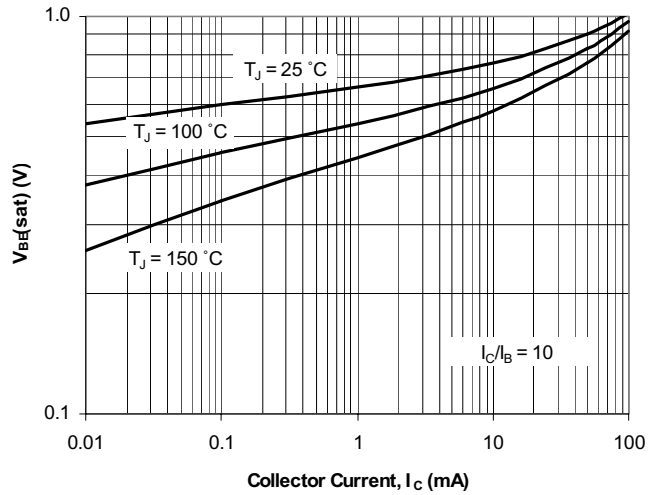


Fig. 4. Typical V_{BE} (sat) vs Collector Current

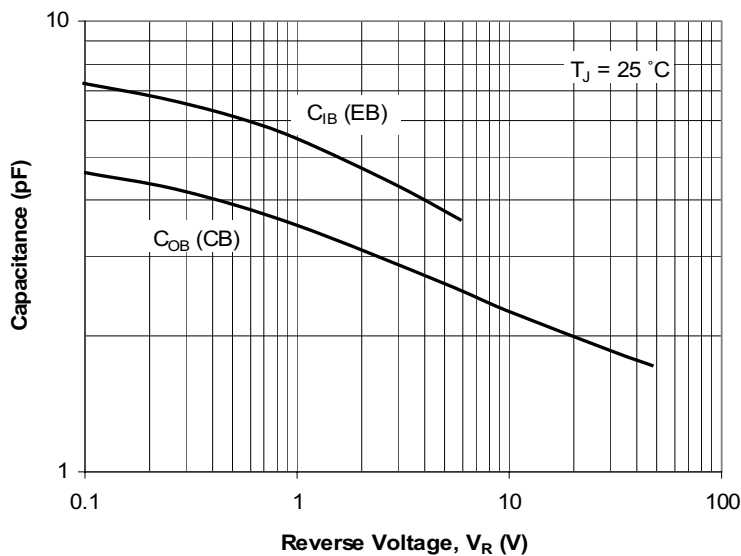


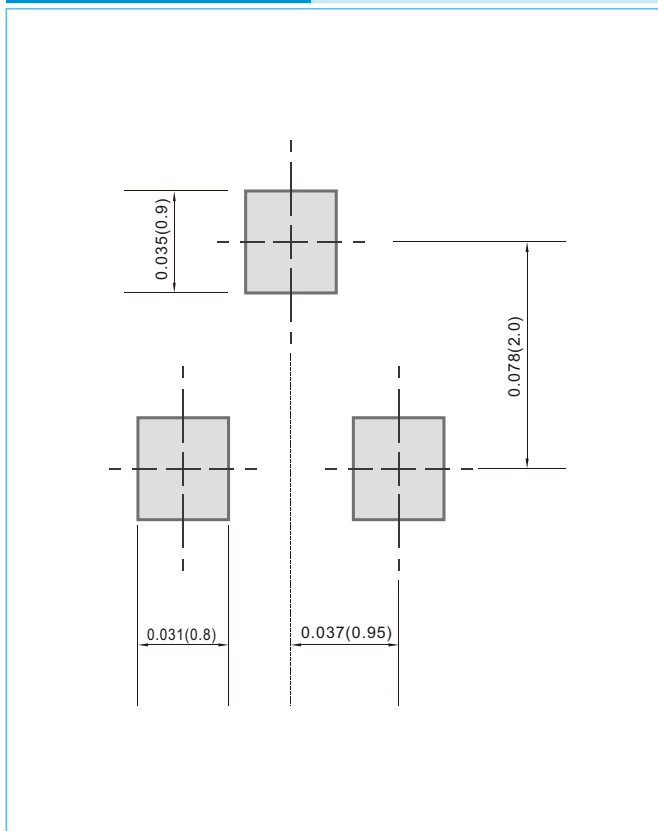
Fig. 5. Typical Capacitances vs Reverse Voltage



MOUNTING PAD LAYOUT

SOT-23

Unit: inch (mm)



ORDER INFORMATION

- Packing information

T/R - 12K per 13" plastic Reel

T/R - 3.0K per 7" plastic Reel

LEGAL STATEMENT

IMPORTANT NOTICE

This information is intended to unambiguously characterize the product in order to facilitate the customer's evaluation of the device in the application. The information will help the customer's technical experts determine that the device is compatible and interchangeable with similar devices made by other vendors. The information in this data sheet is believed to be reliable and accurate. The specifications and information herein are subject to change without notice. New products and improvements in products and product characterization are constantly in process. Therefore, the factory should be consulted for the most recent information and for any special characteristics not described or specified.

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